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large range of amperages and frequencies be made, but I am not certain that I shall be able to carry these out in the near future. The difficulties in the way of securing adequate control of current when high amperages are used are greater than may appear to the casual reader.

KNIGHT DUNLAP

JOHNS HOPKINS UNIVERSITY,
December 20, 1910

THE GERM CELL DETERMINANTS IN THE EGGS OF
CHRYSOMELID BEETLES

PARTS of my papers on "The Origin and Early History of the Germ Cells in Some Chrysomelid Beetles,"¹ and "The Effects of Removing the Germ Cell Determinants from the Eggs of Some Chrysomelid Beetles"² have recently been subjected to criticism,³ which, it seems to me, needs some analysis. I have shown in these papers that a disc-shaped mass of darkly staining granules appears at the posterior end of the eggs of certain chrysomelid beetles just before deposition. Because of the shape of this mass and its position in the egg, I have called it the "pole disc." During the formation of the blastoderm, those cleavage products which, in their progress toward the periphery, encounter the pole disc granules, gather these about themselves and continue their migration, finally becoming entirely separated from the egg. They then lie in a compact group at the posterior end. These are the primordial germ cells; they can be traced back into the embryo, where they separate into two groups which become the germ glands. The conclusion was reached that the cleavage products "are potentially alike until in their migration toward the periphery they reach the 'keimhautblastem.' Then those which chance to encounter the granules of the pole disc are differentiated by their environment, *i. e.*, the granules, into germ cells; all the other cleavage products become somatic cells" (1908, p. 21).

¹ *Journ. Morph.*, Vol. 20, 1909, pp. 231-296.

² *Biol. Bull.*, Vol. 16, 1908, pp. 19-26.

³ Wieman, H. L., "The Pole Disc of Chrysomelid Eggs," *Biol. Bull.*, Vol. 18, 1910, pp. 180-187.

It was found to be possible to remove the pole disc from freshly laid eggs by pricking the posterior end with a needle and allowing them to flow out. Eggs operated upon in this way produced embryos and larvæ either without germ cells or with only a few. This experimental evidence, added to that derived from the morphological study, seemed to prove that the pole disc granules were necessary for the production of the primordial germ cells and, in fact, determined them as such. This led to the conclusion that the "granules of the pole disc are therefore either the germ cell determinants or the visible sign of the germ cell determinants" (1908, p. 21). Recent experiments give additional evidence. When the posterior ends of freshly laid eggs are killed with a hot needle, thus preventing the pole disc from taking part in development, no germ cells are produced in the embryos and larvæ which develop from them.

Wieman objects to the term "germ cell determinant" since "the term implies the attribute of certain potentialities that these granules have not been shown to possess" (1910, p. 180). He also objects to my hypothesis that the pole disc granules consist of chromatic material extruded by the nucleus of the oogonium, and claims that "the granules of the pole disc consist of particles derived from the food stream of the ovum that form an accumulation of the protoplasm in its posterior part" (1910, p. 187). This is no doubt correct. I did not attempt to discover the origin of these granules, but concluded that they were of nuclear material because of the derivation of similar substances in the early development of *Ascaris*, *Cyclops* and a number of insects. According to Wieman, "the granules are not all taken up by the cells in their migration and the greater part of them remains behind after the cells have passed through" (p. 186). This is certainly not the case in the four species of beetles that I have used in my work.

Wieman suggests several possibilities as to the ultimate origin and significance of the pole disc granules. These possibilities were

fully considered in my papers as the following quotations will show. Wieman says (p. 186), "The granules may therefore be of the nature of chromatin and actually represent the chromatin of the nurse cells. . . ." In my paper (1909, p. 274) is this statement, "the granules of the pole disc may be derived from the nuclei of the nurse cells which, in many insects, pass into the early oocytes." Again Wieman remarks (p. 186) "The fact that the pole disc occupies a position between the pole cells and the yolk gives a considerable foundation for regarding it as a source of nutrition for these cells." My suggestion reads as follows (1909, p. 275) "they may hasten the growth at the posterior pole of the egg, and that later they may possibly increase the vigor of the pole cells. That the pole cells need special means of nourishment is doubtless the case, for, contrary to the condition in the blastoderm cells, they are at an early period entirely separated from the yolk, and later use up energy in their migration."

Furthermore, Wieman unconsciously admits that the pole disc granules are really germ cell determinants in the following words (p. 186): "If then the pole disc represents a part of the nutritive stream of the ovum that has not been transformed into ordinary yolk, but instead has been reserved to supply the pole cells, the conclusion presents itself that the latter as a result of this special kind of nutrition, undergo a peculiar method of metabolism which differentiates them from the somatic cells."

An account of the significance of the germ cell determinants in chrysomelid beetles and other animals is now in press.⁴

R. W. HEGNER

UNIVERSITY OF MICHIGAN,
December 21, 1910

THE AMERICAN ASSOCIATION FOR THE
ADVANCEMENT OF SCIENCE
THE MINNEAPOLIS MEETING

REPORT OF THE GENERAL SECRETARY

THE sixty-second meeting of the American Association for the Advancement of Science

⁴ *American Naturalist*.

was held at the University of Minnesota, Minneapolis, December 27 to 31, 1910. The registered number of members in attendance was approximately 500, but the actual attendance was probably not far from 1,200. Both in registration and attendance the meeting was an advance upon those of St. Louis and New Orleans. It also furnished an illuminating answer to the question whether a successful and well-attended meeting can be held in the middle west.

All meetings of the sections and affiliated societies were held on the campus of the university, with the exception of the Thursday sessions of the botanists and the entomologists, which were held at the college of agriculture. Three public addresses were held. On Tuesday evening, the retiring president, Dr. David Starr Jordan, gave his address, "The Making of a Darwin," in Minneapolis. On Thursday evening, Mr. W. A. Bryan gave an illustrated public lecture on the Hawaiian volcano Kilauea. On Wednesday evening in St. Paul, Mr. A. B. Stickney delivered a public lecture on the subject, "Should Practical Agriculture and the Physical Development of Childhood be Added to the Curriculum of the Public Schools." Of general interest also was the symposium on aviation under the auspices of Section D on Friday, and the unusually well-attended dinner and convention of Sigma Xi on the afternoon of the same day.

Section A and the Chicago Section of the American Mathematical Society met for the most part in joint session, with a total of 34 papers. On Friday afternoon they considered the report of the Committee on the Teaching of Mathematics to Students of Engineering. Section B and the American Physical Society met constantly in joint sessions, at which 33 papers were presented. In addition, a general interest session in charge of Section B was held on Thursday morning, while in the afternoon, B and D met jointly for the reading of the vice-presidential addresses.

In accordance with the present plan, Section C held no meetings apart from a session for the delivery of the vice-presidential address. All sessions of the general program